REMARKS

CLAIMS

Claims 34-38 are pending in this application. Claims 20-33 have been cancelled without prejudice or disclaimer. Claims 34-38 have been newly added. No new matter has been added. The new claims are directed to the same invention as the cancelled claims. Compare new claim 34 and cancelled claim 25. Accordingly, the new set of claims should be examined on their merits in view of the rejections of record, as follows.

Patentability of Claims under 35 U.S.C. § 103

The rejections of: claims 20-24, 30 and 32 under 35 U.S.C. §103(a) as being unpatentable over Blonder et al., U.S. Patent No. 4,897,711, previously relied upon, in view of Collins et al., U.S Patent No. 5,852,696 previously relied upon, and Ladany, U.S. Patent No. 5,048,919 newly cited; and claims 25-29, 31 and 33 under 35 U.S.C. §103(a) as being unpatentable over Blonder et all, in view of Ladany have been rendered moot in view of the cancellation of claims 20-33 without prejudice or disclaimer. New claims 34-38 are patentable over the references relied upon in these rejections and the remainder of the art of record for the following reasons.

According to the invention as claimed, the optical module has a resin case type plastic package having a base 40 and a cap 80, a lead frame 50, a die pad 51, a cavity 44, and a substrate 30 mounted on the die pad. Optical devices are mounted on the substrate, and a V groove 31 is provided in the base, which further has a first U groove 42 and a second U

groove 43. See Figs. 1A-1C of the present application. A projection 45 is formed between the cavity and the second U groove, and the first U groove is provided in the projection. Also, an optical fiber having a bare fiber portion 20 and a jacket covering portion 21 covering the bare fiber portion are provided with the bare fiber portion being fixed to the V groove and the first U groove and the jacket covering portion being fixed to the second U groove. *See,* page 39, lines 5-10 of the specification. As set forth in claim 34, the depth of the first and second U grooves is formed so that the relative height of the fiber increases from an extreme end thereof at the V groove portion to the U Groove, as shown in Fig. 1B. *See* also, page 39, lines 10-13 of the specification. The optical fiber is fixed so that the optical fiber has flexure at the portion between the V groove and the second U groove, and the optical devices and the extreme end of the optical fiber are encapsulated with transparent silicon resin gel, as explained on page 39, lines 13-15 of the specification. .

Therefore, according to the invention, when a fiber 20 is fixed to a V groove 31 (that is, a bare fiber portion) and a first U groove 42, the fiber has flexure at the portion between the V groove 31 and a second U groove 43, and the optical fiber fixed to the U groove 20 is encapsulated with transparent silicon resin gel. In this way, the tip of the fiber in the V groove 31 is parallel to a surface of a substrate 30 and a fiber on the U groove 20 is also parallel to a surface of a base 40.

Although Blonder is relied upon for disclosing an optical module substantially as claimed, the pending claims set forth the combination of the V groove and first and second U grooves that is not disclosed by Blonder. Additionally, claim 25 sets forth that the refractive index of the transparent silicon resin gel is substantially equal to the refractive index of the

optical fiber. Blonder sets forth an optical device that is optically coupled with an optical fiber using silicone, as set forth in column 7, lines 1-3, However, Blonder does not disclose using a silicone resin or silicone gel, as claimed by Applicants in claim 34.

Collins is relied upon for disclosing an optical electronic device coupled to a communication processing unit . However, in Collins, the laser element 10 formed on the heat sink 50 is fixed on the fiber by using UV radiation curable adhesive. *See*, Fig. 1, col. 4, lines 17-21 and col.6, lines 29-40 of Collins. The surrounding portion of heat sink 50 and the laser element 10 is fixed by using silicon gel. The UV resin has a merits such as it hardens and fixes any element abruptly and the silicon gel disclosed by Collins is used as a cap that contributes to controlling excess humidity affecting the optical device. *See*, col. 3, lines 60-64 of the reference.

Unlike the UV curable resin junction disclosed by Collins, in the present invention, the optical devices and the extreme end of the optical fiber are encapsulated with transparent silicon resin gel so that the optical element can endure a heat cycle in a manufacturing process. During such a process, stress is induced that causes breakaways and/or vacancies between the optical device and the optical fiber which have been fixed together at a previous step in the manufacturing process. The vacancies make reliability of the optical device extremely low. The silicon gel covers the tip of fiber and the optical device in the present invention and contributes to reducing excess moisture tolerance while providing strength for temperature induced stress.

Further, as a result of a heat cycle in a manufacturing process, optical device prolongation occurs in the optical module as a whole and as a result the tip of the optical fiber

may be made to contact the optical device. Usually, a distance between the tip of the optical fiber and the optical device is about 10 μm, which is narrow, and this spacing is needed to keep the optical coupling efficiency at a maximum. When a tip of the optical fiber makes contact with the optical device, the tip of the optical fiber pushes the optical device and causes stress in the optical device. Conversely, when the whole optical module is shrunken by heat stress, the distance between the tip of the optical fiber and the optical device becomes larger than that of the predetermined value. This larger distance causes deterioration in the optical coupling efficiency, which is disadvantageous. These problems are overcome by the present invention as claimed, which is not obvious in view of the Blonder and Collins references.

The Ladany reference has been cited for disclosing that "the silicon composition cures to a flexible, adherent, transparent, hydrophobic gel, 18, which completely encapsulates and seals the gap" (column 3, lines 52-54). However, the reference fails to show that the claimed combination of the invention which provides for flexure of the optical fiber. Accordingly, Ladany, in combination with either of Blonder and/or Collins does not rendere the invention as claimed unpatentable under 35 U.S.C. § 103. Accordingly, pending claims 34-38 should be found to be patentable over the art of record.

CONCLUSION

In view of the foregoing amendments and remarks, reconsideration and reexamination are respectfully requested.

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